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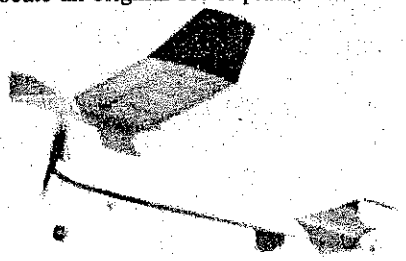
CO-2 Replica:

deBolt's 1946 Airfoiler

Resurrected from 1946, this down-sized version shows off the engineering talents of a young designer who has become a fixture on the modeling scene. ■A.A. Lidberg

IF YOU'VE been following the CO_2 replicas I've done for *Model Aviation* in the past, then you know we've taken a look at some really interesting models, both from the Old Timer and later Nostalgia periods. My selection this time falls just at the start of the Nostalgia period, as it was originally kitted in 1946. In the back of my mind I remembered the Airfoiler from magazine ads of the mid-1940s, and I was fortunate to locate an original set of plans.



With its airfoiled body, high pylon, four fins, and slight dihedral in the stab. the Airfoiler won't get mistaken for any modern model, nor is it likely to be confused with other older models. I believe you'll be pleasantly surprised at how well it can fly as a CO_2 replica.

The original Airfoiler was designed by Hal deBolt. As you may know, he has designed, built, competed with, and kitted models in Free Flight, Control Line, and RC. Before starting the replica, I wrote to Hal to see what he would/could comment on the Airfoiler 35 years later. He wrote back to say that the body shape was chosen to be a box that was quick to build, have some visual appeal, and hopefully to gain some lift. Several versions of the Airfoiler were built, one of which won a contest with a flight of 1 hr., 9 min. After working with a derivation of this design for about three years, he became deeply interested in Control Line, after which he never flew Free Flight again. (Obviously, FF's loss was CL's and RC's gain).

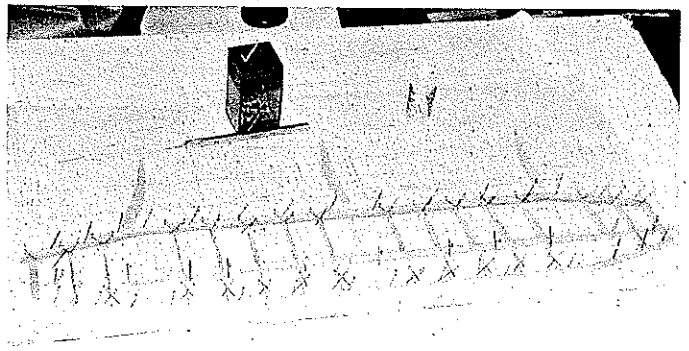
Construction of the replica Airfoiler is fairly easy. It is basically very much like the full-sized version but has been simplified somewhat to ease building and to save weight. My model weighs 44 grams complete with motor. It is a bit heavier than my past CO_2 replicas, but the wing area is also a bit larger. The additional weight is no problem. I would suggest you spend some time at the wood rack in your local hobby shop to select light, soft-to-medium grade balsa.

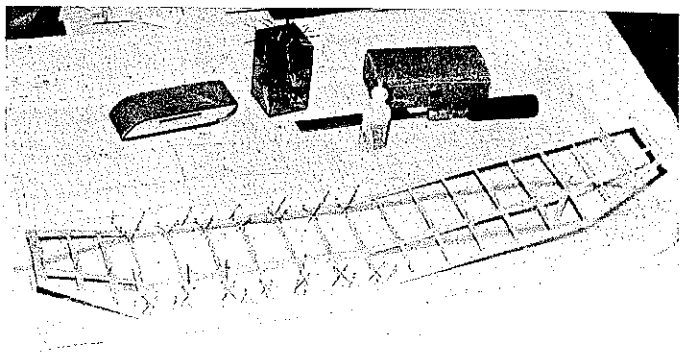
Wing. Make cardboard or plywood templates for the ribs. Tracing around the templates with a sharp X-Acto knife, cut the ribs from 1/20 or 1/16 sheeting. Stack all the 'A' ribs on a piece of spar stock, and sand them to shape. Pre-shape the trailing edge now (easier here than after the wing is built) using a sanding block.

Pin the leading edge (LE) and trailing edge (TE) to the building board, remembering to elevate the front of the TE 1/32 in. with either scrap balsa or card stock. Fit a couple of the 'A' ribs in place to locate the spar, which also must be blocked up to be flush with the rib's lower edge. Fit the tip ribs in place, and block up the 1/16-sq. tip spar.

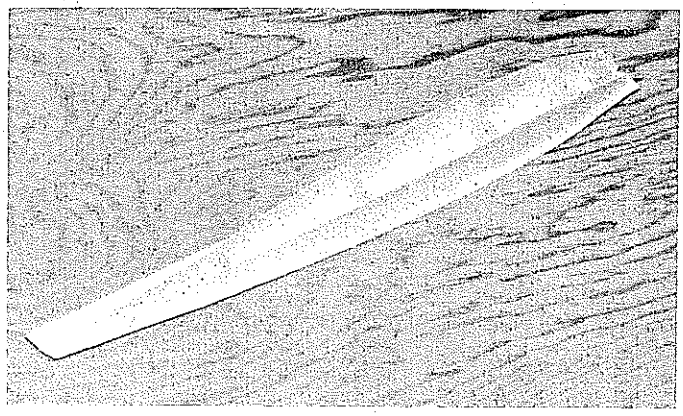
Glue in all the ribs except for those at the center and polyhedral breaks. Remove the tip panels, brace up to the proper angle and sand the edges to mate with the main wing panels. When dry, cut the wing apart at the center and rejoin at the proper angle. Make

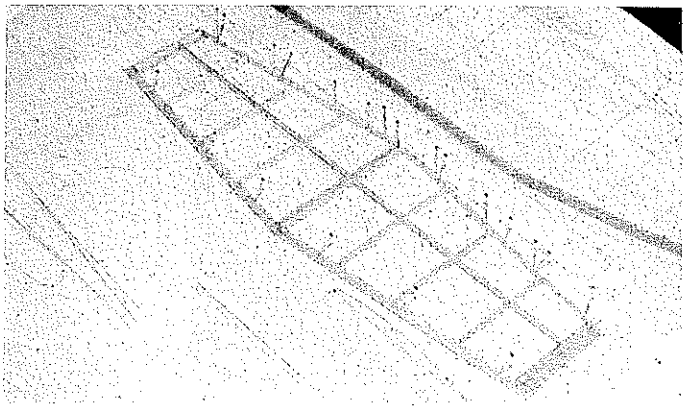
Our author steps into another launch of this 1946 replica on a near picture-perfect day.





Left: The framed-up wing. Take note of where the shims are located. Right: Make the di/polyhedral breaks carefully; there is no bracing.





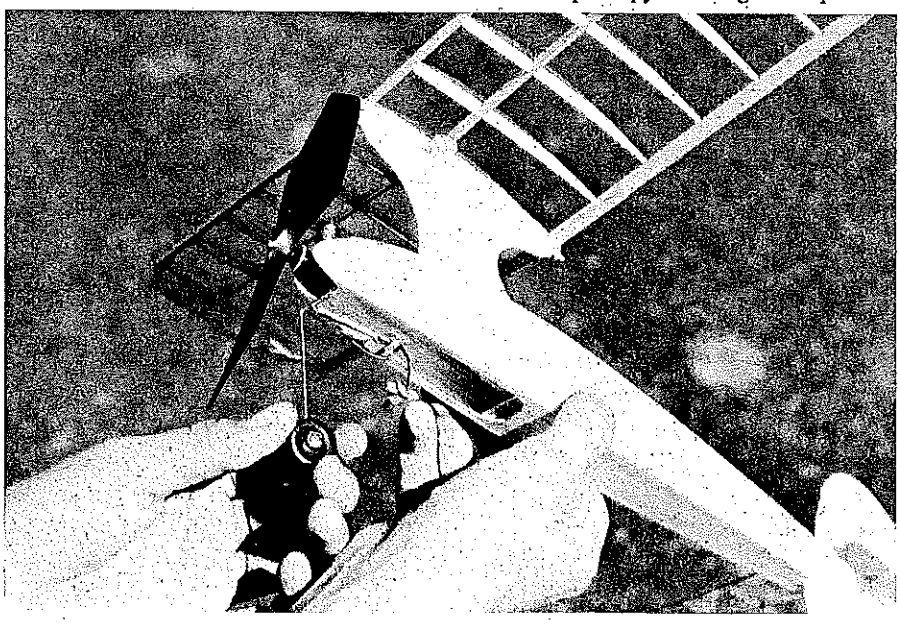
Left: Construction of the box fuselage goes quickly, and the finished product belies its simplicity. Right: Build the stabilizer in the same manner as the wing was constructed. Crack it carefully in the center, and block up the wing tips to glue in the unique stab dihedral.

this and the tip break joints with a minimum of gaps, and they'll be strong enough without extra bracing.

Stabilizer. Build in a manner similar to the wing, except the ribs don't need to be cut out first—they can be sanded to shape from strip stock after being glued in place. The stab is then cut in half and rejoined with the dihedral shown on the plans. Note the completed stab has three slots for fins—two in the bottom at the tips and one at the center for the large top fin.

Fuselage. Cut out both sides, the motor mount, and the formers. Add the balsa scrap braces to the mount. Sew the landing gear to the back of the mount with heavy thread, then lightly coat with epoxy or Hot Stuff cyanoacrylate (CyA). Mark the mount and former locations on the inside of each body side, and glue together off the board starting with former F3 and the rear edges. Glue the mount and remaining formers in place. Cut an oversize piece of 1/32 sheeting for the bottom, and glue it to the sides/former assembly.

Make up the pylon using a stiff piece of 1/16 sheeting with dowels glued into the slots at the top. Taper the 1/32 sheet doublers before gluing them in place. Make up the wing platform, and add it to the top of the pylon. Glue the pylon in place. Cut a slot for the pylon in an oversize piece of 1/32 sheeting for the body top, sliding it into place from the rear.

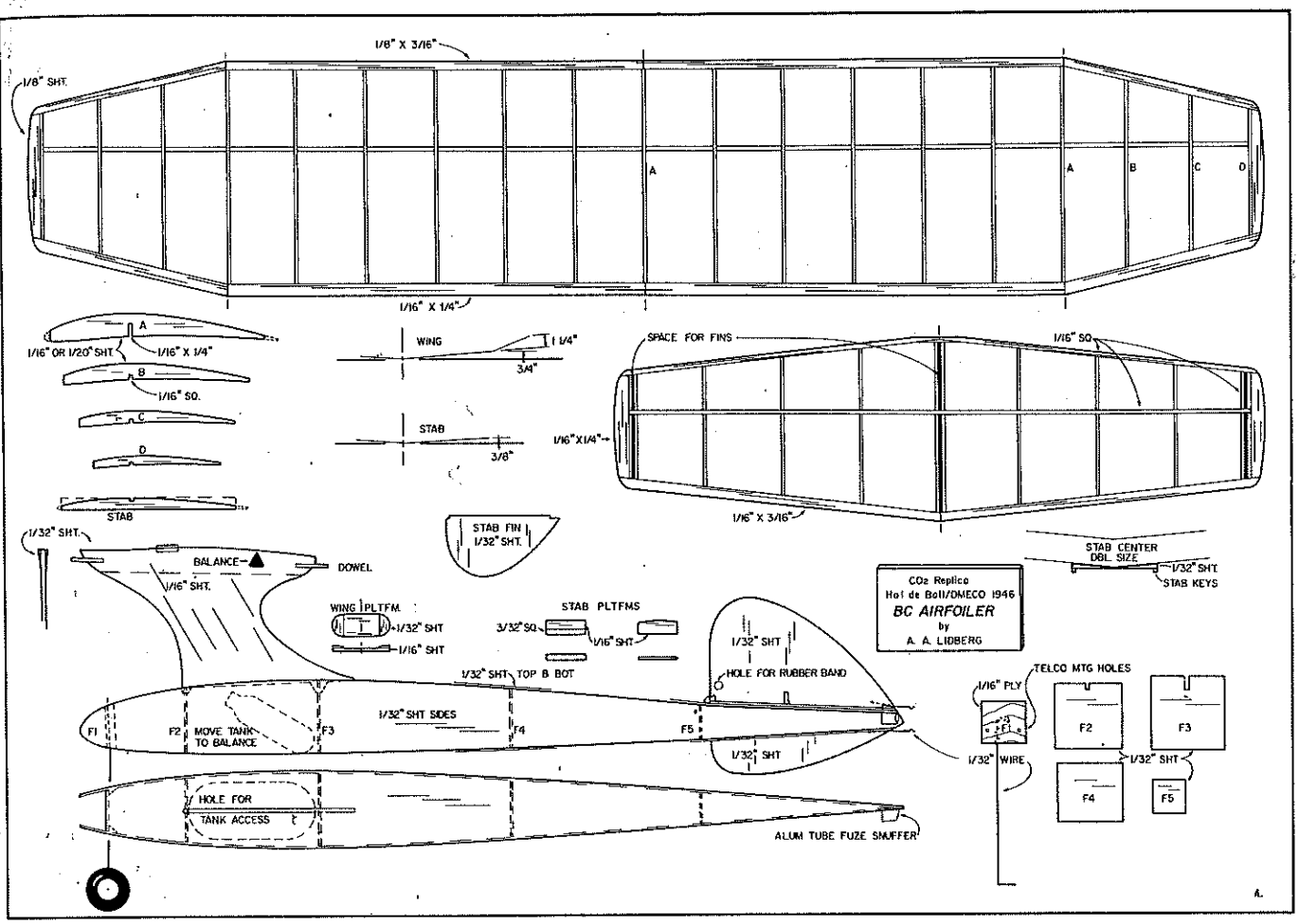


Wire landing gear is sewn to the fuselage, then the thread is coated with CyA. Opening in the bottom allows access to the CO-2 tank and charge fitting which simplifies motor removal.

Make up the stab platforms, and glue them on. Add the center sub-fin, making sure it is straight and in line with the pylon. Cut the large opening in the bottom of the body for access to the CO_2 tank. Arrange the tubing so that it leads back and down along one side of the fuselage and then up into the cavity. The charge fitting can be left hanging. Attach the motor to the firewall with small wood screws. Once the model's balance is properly set by moving the tank fore or aft as needed, the tank can be braced in place.

Covering and finish. Sand the wing and stab LE and tips to a smooth contour, and get rid of any glue bumps that might show through the tissue. Cover the wing and stab with lightweight, brightly-colored tissue. Put two or three coats of unthinned dope on all rib and spar lower edges, LE and TE, plus the tops of the dihedral and polyhedral break ribs.

Lay pieces of tissue on the individual panels (i.e. main wing panel lower surface, wing tip lower surface, etc.) and use thinner on a brush applied to the tissue to soften the dope for adhesion. Rub the tissue down with your fingertips, especially on the undercamber ribs, to make sure it sticks. Lightly spray the tissue with water to shrink



it. When dry, apply one coat of very thin low-shrink dope (Sig Lite-Coat for example). Add tissue numbers or other decoration, using thinned dope as the adhesive. Give the fuselage a couple coats of dope to help keep it clean.

The stab's dihedral won't let it sit securely on the flat platforms, so add some tapered pieces of 1/32 sheeting on each side of the center break under the LE and TE. Glue the fins in place; add the dethermalizer (DT) wire fittings and dowel hold-down in front of the stab. Fit the stab in place temporarily and make sure the large fin is directly in line with the pylon. When it is straight, glue short lengths of 1/16-sq. keys to the stab alongside the platforms. The keys make sure that the stab/fins always point the same way so you'll be able to achieve and maintain consistent trim settings.

Make up a limit string (fishing line, thread, or .008-in. Control Line wire) so that the stab will pop up to about 45°. Glue the aluminum snuffer tube to the body. Hal deBolt, by the way, used a spoiler system on the wing to bring the original Airfoiler down. You could, of course, skip the DT and glue the stab in place if you've built heavy and stay with low power settings.

Add a lightweight plastic or wooden wheel. Check each wing and stab panel for warps, and steam them flat if necessary. Assemble the Airfoiler with rubberbands. Check the balance, moving the tank as needed. If tank movement won't do the job, add clay ballast forward or aft as required to achieve the correct balance point.

Test-glide the model. Aim for a smooth glide with a fairly wide turn (50 to 100 ft.) in either direction. If the turn is too tight, cut a tab in the large fin, and offset it as necessary. If the model seems to dive in, add some shims (card stock) under the TE of the stab. If it stalls, put the shims under the LE.

When you're satisfied, try some low-power flights with a 40- to 60-second run time throttle setting with a gas charge (charger pointing up). Hal says the Air-

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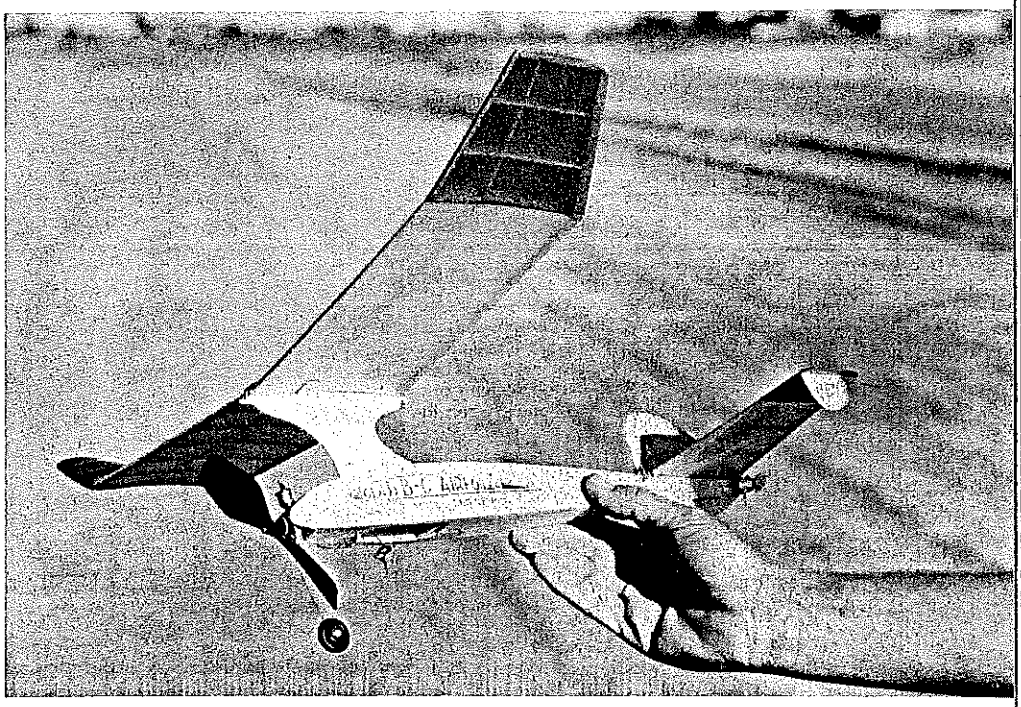

The finished model with the original kit logo on its side. Model did ROGs off the dirt runway in the background. Build light as per the instructions and incorporate a positive DT system.

Stearman are made by Williams Brothers. Add your wheels, engine, and propeller to check whether your Stearman balances as shown on the plan. If it needs nose weight to achieve the proper balance, add it; if it is a bit nose-heavy, don't worry at this point. Finish off the lead-outs; thread them through the holes in the N strut guide, and form the eyelet ends per drawings in the AMA rule book.

It's time to find a field to dust. I always fly ½A models on steel lines; they fly so much better and are more safe. Hook up a set of 30-ft. lines, fuel the tank, and start the engine. The Stearman is a spunky flier and a lot of fun.

If you haven't treated yourself to a Control Line biplane before, this one is sure to please. To tone it down a bit for training flights, try putting the prop on backwards and use 35-ft. lines. This will help slow it down without cutting the flight performance very much.

Just think how the guys at the club will react when you tell them you've just soloed your Stearman and are thinking about taking up aerobatics or crop dusting with it. Have fun, and keep 'em flying!

CO-2 Airfoiler/Lidberg

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foiler should climb to the left (usually considered the kiss of death for a pylon model), and sure enough my replica Airfoiler climbs nicely in a wide left turn.

If your model exhibits tight turning tendencies under power, put shims between the motor and the mount to offset the thrust line for opposite turn. As you firm up the trim settings, switch to a liquid charge (charger pointing down), and experiment with the throttle settings. Most of my CO_2 replicas fly longer when the motor is operated at somewhat less than full power.

I don't mind telling you that I was really pleased with the way the replica Airfoiler flew the first day out. I am very cautious and use a DT fuse even for low-power test flights. With this model it was a wise precaution, as the first three flights dethermalized at about 200 ft. and rising after a 90-sec. flight. While it's not very common, there was a stationary thermal column at the field that day that seemed to stay in one place for over an hour. After a few more flights like that, we tried ROGs from the dirt. The Airfoiler lifted off nicely, although with CO_2-powered models, ROGs always seem to cost a lot of altitude.

Hope you've enjoyed this latest little trip into modelling's history. These replicas enable us to make examples of many neat models without filling up the workshop or going broke in the process. So—enjoy—fly CO_2.

Elec. Jr. Clipper/Morris

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With seven 800 mAh cells, it comes out at 35 oz. The climb is better at the lower weight, but the total flight time is less. Mostly I have been using a Kyosho prop.

At 40 oz. the wing loading is high, about 18 oz./sq. ft., and you need to keep the flight speed up. I have had some nice snaps when I tried to float into a turn too slow and too tight. With the 800 mAh cells, the reduced weight provides a less touchy flight.

The Astro 075 I have been using is the old-style type. The climb was much better with a Kyosho 360 PT motor. Nice performance was had with both the Kyosho prop and a reworked Top Flite 11-7.

If the pre-release reviews from both the manufacturer and the press are true, the ideal power package for this type of plane with this wing area sounds like the new Astro Cobalt 035 with a belt or gear reducer. This would bring the wing loading down to the range of a Sailplane while providing plenty of power to get upstairs. With the motor systems I have used, the power portion of the flight is fine, but the glide and thermaling ability suffer somewhat. Another option would be to stretch the wing an extra bay or two, but this would probably upset the purists whose delight is true scale.

There are many ½A Texaco designs that would make beautiful Electric conversions. I have enjoyed flying my Clipper on calm days and letting it fly as a Free Flight without touching the transmitter—except for an occasional nudge to bring it back upwind.